

REMARKS

Claims 1-5, and 7-19 are pending herein.

1. Claims 1-5, 8-13, and 15-18 were rejected under 35 U.S.C 103(a) as being unpatentable over Weismann et al. (6,794,339) in combination with either deBabadillo, II et al. (4,962,085) or Yoshida (5,206,216) further in combination with Van Buskirk (5,653,806) further in combination with Reeves et al. (2005/0014653). This rejection is respectfully traversed for the following reasons.

The claimed invention is drawn to a process for producing long lengths of layered superconductor. The claimed invention particularly calls for coating a buffered metal substrate tape with precursors by metalorganic deposition (MOD) to form a coated tape. New claim 19 clarifies that MOD includes applying a solution of organic complexes of rare-earth, barium, and copper to the buffered substrate tape and heating the coated tape to remove the organic compounds. The coated tape is translated through a conversion zone at a rate of at least about 10 meters per hour while oxygen and water vapor are introduced through a showerhead. Achieving a throughput of at least about 10 meters per hour for an ex-situ process is significant in this regard.

There are a number of techniques for forming a superconducting coating on a substrate. These techniques can be classified as *ex-situ* processes and *in-situ* processes. In an *in-situ* process, such as pulsed laser deposition (PLD), sputtering, and metalorganic vapor deposition (MOCVD), growth of the superconducting coating occurs in a single step. *In-situ* processes do not require a separate conversion reaction and can deposit a superconducting film at a rate of up to 1-5 microns per minute. The *in-situ* processes are well suited for high-throughput applications. See, Paragraphs [0006] and [0011] of the Present Application.

Unlike the *in-situ* processes, *ex-situ* processes are significantly slower processes because the chemical reactions that form a superconducting coating using *ex-situ* processes are different from the *in-situ* processes. In an *ex-situ* process, such as metalorganic deposition (MOD), spray pyrolysis, and BaF₂ post annealing, precursors are deposited atop a substrate and subsequently undergo a separate chemical reaction that converts the precursors to a superconducting coating

(paragraph [0007] of the Present Application). The conversion reaction required in the *ex-situ* process occurs on the order of 1 Angstrom per second, which is about three orders of magnitude slower than an *in-situ* process. Utilizing different precursor chemicals alters the chemical reaction for conversion to a superconductor material in this inherently unpredictable art. In a particular MOD process, trifluoroacetic acid complexes of rare-earth, barium, and copper are mixed in a solvent and applied to the substrate, such as by dipcoating. In order to form the superconductor layer, the organics are baked off, and the remaining material undergoes a separate annealing process to crystallize into a superconducting layer. Alternatively, in a particular BaF₂ post annealing process, a metal containing layer is formed by the deposition of rare-earth, barium fluoride and copper metals. The metal containing layer is oxidized in the presence of water vapor and oxygen and undergoes a separate annealing process to form the superconducting layer.

Clearly, one of ordinary skill in the art would have understood that a throughput rate of an *ex-situ* process cannot be predicted using a throughput rate of an *in-situ* process because the chemistry in forming the superconducting layers are different in this unpredictable art, and that a separate operation is required for the *ex-situ* process to yield a superconducting layer, whereas, the *in-situ* process does not require this separate operation.

The USPTO relies upon Weismann to teach particular portions of claim 1. Weismann discloses an *ex-situ* process including forming a precursor film and heat treating the precursor film at sub-atmospheric pressures in the presence of oxygen and water vapor (Weismann in Abstract). Specifically, Weismann utilizes the BaF₂ post anneal process in which a precursor film consisting of BaF₂, Y, and Cu is deposited onto a substrate using vapor deposition (Weismann at col. 4, line 59 through col. 5 line 4). During the heat treatment step, the superconducting film grows at a rate of from about 1 to about 20 Angstroms per second (Weismann at col. 4, lines 20-22). The USPTO states Weismann fails to teach a process utilizing coated tapes. Therefore, Weismann does not teach translating a coated tape through a precursor conversion zone in a process chamber at a rate of at least about 10 meters per hour.

The USPTO relies on DeBarbadillo or Yoshida to allegedly suggest modifying the *ex-situ* process of Weismann to include translating a coated tape through a conversion zone.

DeBarbadillo discloses a metal superconductor precursor layered on a metal substrate (DeBarbadillo at col. 4, lines 18-31). The metal substrate can include tapes, ribbons, and wire. (DeBarbadillo at Abstract, Fig. 1, and col. 1, lines 1-15). Yoshida discloses an *in-situ* pulsed laser deposition (PLD) method for depositing a superconducting film on a metal tape (Yoshida in Abstract). A laser is utilized to vaporize superconductive material from a target of superconductive material (Yoshida at col. 2, lines 22-25). The vaporized material is deposited on a metal tape that is translated through a deposition zone (Yoshida at col. 4, lines 13-20 and lines 37-47). The superconductor film is allowed to slowly cool under a relatively high pressure of oxygen, so that a superconducting wire having uniform characteristics is obtained (Yoshida at Fig. 3 and col. 5, lines 46-53). Yoshida teaches that PLD is particularly suited for fabrication of long lengths of tape and can achieve a throughput of about 5 cm/min to 50 cm/min (3 to 30 meters/hour) due to the high deposition rate of PLD (Yoshida at col. 2, lines 60-69).

Further, the USPTO acknowledges that Weismann in combination with DeBarbadillo or Yoshida fail to teach the use of a showerhead to supply oxygen and water vapor. As such, the USPTO relies on Van Buskirk to allegedly suggest modifying the *ex-situ* process of Weismann in combination with DeBarbadillo or Yoshida to include introducing oxygen and water vapor through a showerhead. Van Buskirk discloses an *in-situ* method using chemical vapor deposition (CVD) to deliver precursor gases and oxygen in order to deposit thin films on a wafer.

The USPTO apparently relies upon Reeves to allegedly suggest modifying the teachings of Weismann, DeBarbadillo or Yoshida, and Van Buskirk to include translating at a rate of at least about 10 meters per hour. Reeves discloses an *in-situ* method including translating a tape through a deposition chamber at a rate of between 0.3 meters/hr and 10 meters/hr (Reeves at paragraph [0063]). Reeves discloses forming the superconductor layer using *in-situ* processes such as PLD and CVD. Specifically, Reeves teaches that PLD can be used to achieve a high deposition rate and that CVD can be used for deposition over large areas at a lower cost (Reeves at paragraph [0037]).

At least some degree of predictability is required to support a finding of obviousness. *See generally*, MPEP §§ 2143.02. *In-situ* and *ex-situ* processes are inherently different, and the chemical reaction required for conversion in an *ex-situ* process is inherently unpredictable. The

USPTO suggests that it would be obvious to increase the rate of translation based on the teachings of Reeves (*in-situ* process). However, one of ordinary skill in the art would have recognized that *in-situ* processes and *ex-situ* processes form superconducting films at significantly different rates using significantly different chemistries. Yoshida and Reese clearly suggest that *in-situ* processes with high deposition rates are better suited for fabrication of superconducting wire at high speeds, such as in a method including translating at a rate of at least about 10 meters per hour. The USPTO has failed to show that one of ordinary skill in the art would have expected to obtain a functional product when accelerating the translation rate during an *ex-situ* process. Indeed, based on the conversion rates and absent Applicant's own disclosure, one of ordinary skill in the art would have expected an incomplete conversion and a nonfunctional product when applying the translation rate of an *in-situ* process, such as the one in Reeves, to an *ex-situ* process, such as the one in Weismann or deBarbadillo. Additionally, the chemical reaction required for conversion is inherently unpredictable, and the *ex-situ* processes of Weismann and deBarbadillo utilize different chemical reactions to form HTS material. Therefore, the references fail to provide an expectation of success when using MOD. In absence of Applicant's disclosure, one of ordinary skill in the art, would have not have expected an *in-situ* process, such as PLD or CVD, to predict translating at a rate of at least about 10 meters per hour using an *ex-situ* MOD process.

For at least the foregoing reasons, Applicant respectfully submits that the presently claimed invention would not have been obvious over the cited prior art. Accordingly, reconsideration and withdrawal of the 103 rejection is respectfully requested.

2. Claim 7 was rejected under 35 USC 103(a) as being unpatentable over Weismann et al. in combination with either deBarbadillo, II et al. or Yoshida further in combination with Van Buskirk et al. further in combination with Reeves et al. further in combination with Manabe et al. or Weinstein. Claim 14 was rejected under 35 USC 103(a) as being unpatentable over Weismann et al. in combination with either deBarbadillo, II et al. or Yoshida further in combination with Van Buskirk et al. further in combination with Reeves et al. further in combination with Ott et al. Applicant respectfully submits that Manabe et al., Weinstein, and Ott et al. fail to address the deficiencies of Weismann et al., deBarbadillo, II et al., Yoshida, Van

Buskirk et al. and Reeves et al. as discussed above. Accordingly, withdrawal of these rejections is respectfully requested as well.

Applicant respectfully submits that the present application is now in condition for allowance. Accordingly, the Examiner is requested to issue a Notice of Allowance for all pending claims.

Should the Examiner deem that any further action by the Applicant would be desirable for placing this application in even better condition for issue, the Examiner is requested to contact Applicant's undersigned attorney at the number listed below.

The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number 50-3797.

Respectfully submitted,

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Date

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